scale). Each bulletin is invariably begun with the letters U.S.W.B. Each station has its code letter, as for instance, NY designates New York. The first three figures express the barometric pressure in inches reduced to sea level; the fourth figure is wind direction (1 = N., 2 = NE., 3 = E., etc.); the fifth and last figure is wind force in the Beaufort scale, except when winds of greater force than 9 occur when words instead of figures will be used.

Base charts (size 11½ by 14 inches) of the Atlantic coast extending to the 55th meridian, will be supplied free to vessel masters who regularly take and forward weather observations to the United States Weather Bureau, or to the Hydrographic Office, United States Navy; others may obtain them at a cost of 75 cents a hundred.

A similar service for the Pacific coast is in preparation and will be announced later.

The advantages to be derived from such a service are manifold. While it is primarily intended for coast use, shipping and the like, it would seem that the fruit grower, the cotton grower, and in fact any large business whose following days' work is largely dependent upon the weather would find this service invaluable. Wireless apparatus has been developed to such a state that for less than $10 a simple outfit may be obtained, which is sufficient to receive from the larger stations, if they are not too far away. At the greatest distance from a sending station in this country a $25 outfit would suffice. The writer has an outfit consisting of an aerial, detector, coil, and phones (cost $10) with which he is able to obtain not only Arlington, but many other stations. Arlington sends out comparatively slowly so that it is but a matter of a few weeks practice before one is able to receive well.—*I. F. H.*

LONG INDIVIDUAL METEOROLOGICAL RECORDS.

In a short article on page 413 of the MONTHLY WEATHER REVIEW for July, 1920, reporting the death of a veteran cooperative observer of the Weather Bureau, at the age of 103 years, the author says: "It is believed that this individual record for more than 66 years is unparalleled in this country, if not in the world."

In this connection I beg to call attention to the meteorological record kept by Mr. H. D. Gowey, at North Lewisburg, Ohio, from January, 1832, to June, 1909, a period of 77½ years.

Mr. Gowey began the observations when he was 13 years old, and continued them at practically the same location up to within a few days of his death at over 90 years of age.

The thermometer was read three times a day, and there is scarcely an observation missing during the whole period of time. The temperature observations were begun in 1832, and the rainfall record in 1852. We know of no other individual series of temperature observations of this length in existence.—*J. Warren Smith.*

THE GREAT SUN-SPOT GROUP AND THE MAGNETIC STORM, MARCH 22-23, 1920.

By the Rev. A. L. CORTIE, S. J.

[Abstracted from Monthly Notices Roy. Astr. Soc., 80: 574-578, 1920, April.]

A small spot appearing December 27, 1919, developed into a fine group which had almost died away at the third return February 17–26; revival took place on an immense scale at the next return March 16–29, the group being the greatest since 1917. The months of December, 1919, and January to February, 1920, were magnetically quiet, only a few days being much disturbed. Moderate disturbances accompanied the appearances of the group January 1 and 28, and a more severe storm on February 24; the March revival was accompanied by a magnetic storm of extreme violence March 22–23. All these disturbances appeared at 27-day intervals.

Cortie holds that the greater frequency of magnetic disturbances near the equinoxes is due to the fact that then the heliographic latitude of the earth is in the sun's semiequatorial plane, i. e., in the region of the sun spots; such a position is particularly favorable in the period after the maximum of a sun-spot cycle, when the mean latitude of the sun spots is falling toward the solar equator (*Cf.* M. N., **73:** 58, 1912; **76:** 16, 1915). In the present instance both these conditions were satisfied.

If we suppose that the requisite ionisation of the upper atmosphere is a gradual process as spots begin to grow in number and magnitude, then the advent of a specially active or large spot will suffice to bring about a great storm. In this case there had been a well-marked drop in the values of the monthly ranges of the magnetic elements since October, 1919, indicating that the ionisation of the upper atmosphere due to the successive presentments of the disturbed solar region in December and January was not sufficiently great to cause any but minor disturbances; the conditions were better in February and a moderate storm took place, but the climax was reached in March, when all the conditions—a great disturbed sun-spot region, a favorable heliographic position of the earth, and a highly charged condition of the upper atmosphere—were realized. Anyone of these conditions alone might be sufficient to cause a storm, and hence storms may appear without spots or very small spots; and vice versa, since a large spot need not necessarily be very active. (*Cf.* M. N., **73:** 155, 1913; Astrophys. Jour., **13:** 260, 1901; **49:** 20, 1919). See MONTHLY WEATHER REVIEW, July, 1920, **48:**379.—*E. W. W.*

INTERNAL FRICTION IN THE ATMOSPHERE.

By D. BRUNT.

[Abstracted from *Quar. Jour. Roy. Met'l Soc.*, April, 1920, 46, 175-185. Shorter abstract in *Nature* (London), Feb. 26, 1920, p. 714.]

The frictional force R acting upon unit volume of the atmosphere may be measured by the amount of horizontal momentum lost per unit of time; this internal friction is chiefly due to eddy viscosity, and according to Taylor the components of R along the axes of x and y are $K\rho d^2u/dz^2$ and $K\rho d^2v/dz^2$, respectively, $R = f(z)$. In the steady state, the forces acting on the air at any level, due to gradient, rotation, and internal friction, must be in equilibrium. Assuming (1), K to be constant throughout the height considered, (2) the gradient wind G to be constant or a linear function of the height z, and (3) the direction of slipping at the boundary to be in the direction of strain, these conditions lead to a vector equation whose solution shows that the wind V at any height is equivalent to G plus an added component $\sqrt{2}G \sin \alpha\, e^{-Bz}$ acting at an angle $\alpha + \frac{3\pi}{4} - Bz$ with the direction of G. This component decreases with height according to the exponential law, rotates its direction uniformly counter-clockwise with increasing height, and sweeps out the equiangular spiral previously treated by Hesselberg and Sverdrup, Ekman,